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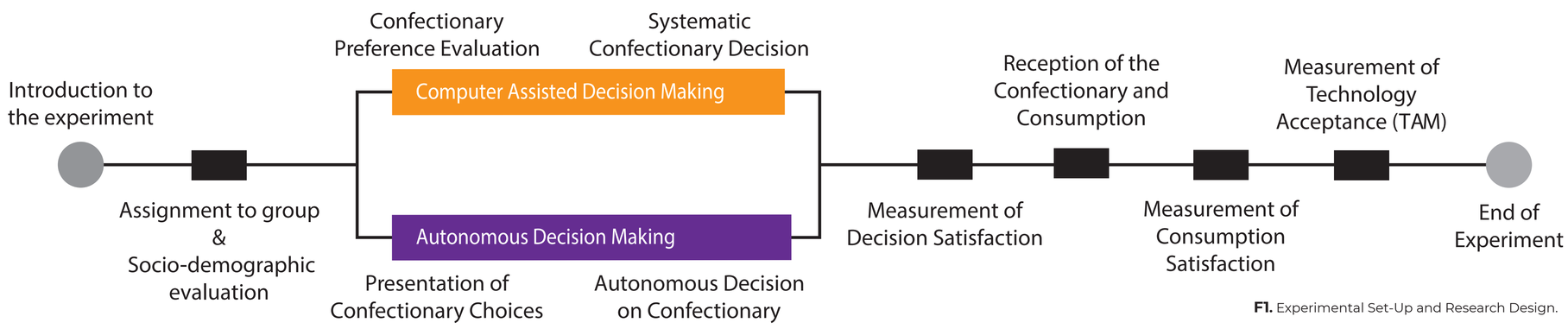
Freedom or Burden of choice?

On the satisfaction with computer-assisted decsision-making

INTRO

Responsibility of machines is rising as we delegate an increasing number of decisions to algorithms and smart devices - decisions that could potentially go as far as signifying life or death[2]. This trend is also reflected in the development of academic interest in "Intelligent Decision Systems"[7]. While we acknowledge the academic emphasis on significant applications, our investigation focuses on the perceived happiness and satisfaction with computer assisted decision making (CADM) in an everyday scenario; in this study selecting confectionary. Research has shown that limiting the amount of options can lead to an increase in decision satisfaction[3, 8]. CADM-applications are likely to lower the amount of options and provide compelling guidance on the selection.
On the other hand however, arises the question how the individual perceives ceding autonomy of decision-making to a machine.

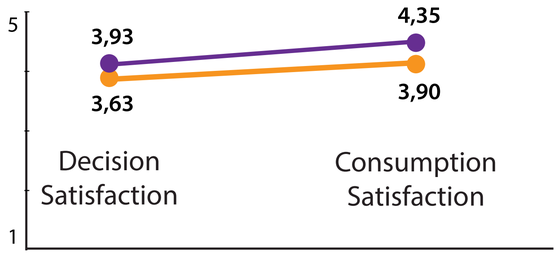
METHOD & SAMPLE



F1. Experimental Set-Up and Research Design.

For the decision process itself we conducted an experiment with two given scenarios:
In the first scenario participants were obliged to pick a confectionery from a given range(24 options) of sweets. The participant has complete freedom about his or hers choice. After deciding for a confectionery the participant was evaluated on their decision satisfaction. After subsequent consumption we measured the perceived satisfaction again to account for potential changes due to the consumption.
For scenario 2 the participant was placed in front of a computer screen running the front-end of the programmed questionnaire. The front-end was designed in a way that would facilitate usage; somewhat similar to a standard questionnaire commonly administered in scientific studies. After finishing all relevant questions to the computer-assistant´s assessment consumers were presented with a computer based choice and subsequently assessed on decision and consumption satisfaction.

ANALYSIS & FINDINGS



F2. Mean Value Levels for DS and CS between the groups (c.f. A1)

Differences in Satisfaction level

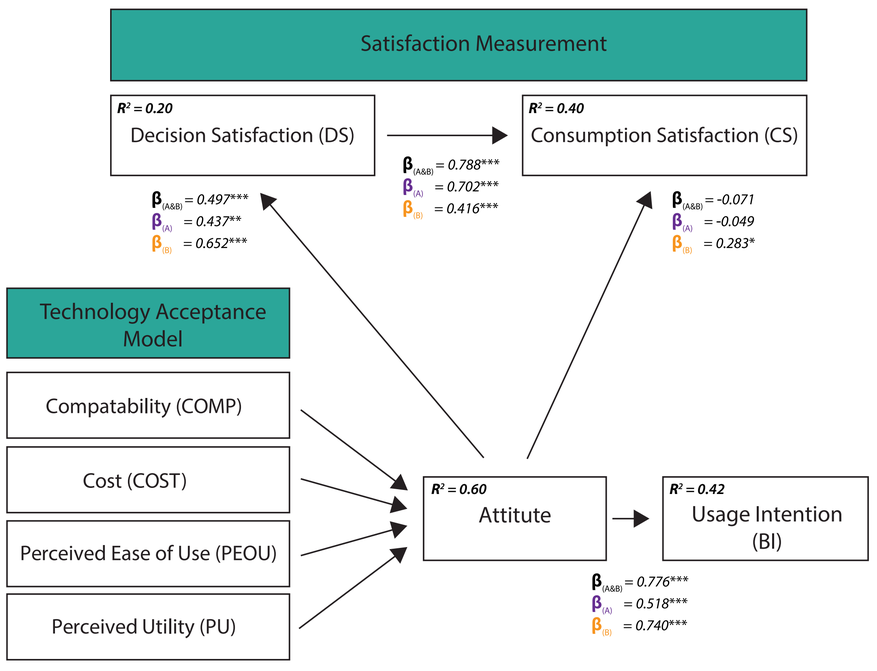
We can report significant differences in the DS (*t(78)=2.85, p.006*) and CS (*t(75.02)=2.94, p=.004*) levels between test and control group. In both scenarios the control group was significantly more satisfied with their choice than the test group. Satisfaction significantly increased between point of decison and consumption for both groups (*Control group: t(39)=-5.07, p=.000; test group: t(39)=2.25, p=.030*). Table **A1** and **F2** report the respective mean value levels and statistical computations.

Moderating Effects on Satisfaction Levels

In order to construct our final SEM we first conducted confirmatory factor analysis using IBM AMOS (Vers. 26) and Smart PLS (Vers. 3.2.8) for SEM. We can report that modelling our initial causal construct resulted in somewhat unsatisfying validity yet satisfying discriminant and convergent reliability (see **A2**, **A3**) when applying recommendations by relevant literature [5, 6] and tolerable model fit (*X^2= 26,821.239; SRMR=0.09*).

There is some issues that will be laid out first: One inter-correlation (DS and CS) violated Fornell-Larcker Criterion [5] but as we assumed correlation between these constructs this is of little surprise. Despite all efforts to smoothen out the data patterns the fit of the data to the model remains questionable. We will still report our findings but note that the generisability and significance of our reportings may be called into valid question.

The analysis of relationships within our constructs suggestes that there is a significant influence (*β=.495, p<.01*). Furthermore DS was a solid predictor for CS (*β =.788, p<.01*) explaining 40 per cent in variance (*R^2=.40*). Attitude, furthermore showed strong influence on the usage intention(*β=.776, p<.01*) and explains similar large proportions of variance (*R^2=.42*).



Notes: Group A = Control Group; Group B = Test Group. R^2 = Coefficient of Determination; β = Path Coefficient; n = 80. Significant at: ***p < 0.01; **p < 0.05; *p < 0.10 .

F3. Final structrual equation model with multigroup analysis results.

Multigroup Analysis

We furthermore ran multigroup analysis on the final SEM to evaluate on the relationship between computer-assisted decision making and perception of its helpfulness in decision making between the two groups. We found several significant differences between the two groups. First, the groups strongly varied in their influence of attitude towards CS (*control group: β=-.049, p=.716; test group: β=.283, p=.051*). Second, the dimensions of the TAM construct (particularly COST) found differing levels of influence between the groups. Interestingly, the path coefficient from attitude towards CADM was fairly high in both groups (*control group: β=-.518, p=.010; test group: β=.740, p=.000*). The difference in this effect size may however be explained by the previous exposition towards a CADM system and, therefore might have been superimposed. → **A4**

DISCUSSION & CONCLUSION

We find that satisfaction levels with the usage of CADM were lower than those decisions that resulted from autonomous choices. This is of little surprise, however we find stronger appreciation of CADM systems for the test group. While this effect may be to a certain degree superimposed we nevertheless find it amusing that – despite the lower overall satisfaction – a preference for these systems was voiced that even supports the usage in daily shopping situations. Researchers generally find a large acceptance of digital concepts in supermarkets amongst German consumers [4].
A re-evaluation of the used scales should provide some insight into improvements in terms of the measurement model. Furthermore, our study faciliated a fairly simple questionnaire that was presented as an artificial intelligence making elaborate confectionary decisions. However, implementation of real data from participants and actual AI embedding would enhance this research significantly.
The need of further digital concepts in shopping processes and the evaluation of the user experience process seems to be a fruitful research area.

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ADDITIONAL INFO

A1. Mean Value Comparison and t-Test statistics.

	Control Group	Test Group	*t*-Test Statistics
DS	3.93 (.36)	3.63 (.56)	$t_{(78)}$=2.85, p=0.006
CS	4.35 (.62)	3.90 (.75)	$t_{(75)}$=2.94, p=0.004
	$t_{(39)}$=5.07,p=0.000	$t_{(39)}$=2.25, p=0.030	

Notes: Standard deviations in parantheses.
DS=Decision Satisfaction; CS=Consumption Satisfaction

A2. CFA Results, Reliability and Validity.

	Construct	Item	Factor Loading	Cronbach´s α	CR	AVE
Category: Satisfaction	Decision Satisfaction (DS)			0.650	0.631	0.259
		DES5	0.536			
		DES6	0.532			
		ARG4r	0.437			
		CCO2	0.618			
		Ur	0.394			
	Consumption Satisfaction (CS)			0.908	0.909	0.569
		COS1	0.858			
		COS2	0.635			
		COS4	0.811			
		COS5r	0.467			
		COS6	0.685			
		COS8	0.541			
		COS11	0.857			
		COS12	1.020			
Category: Acceptance of Computer-Based Decision Making	Cost			0.864	0.868	0.768
		COST1r	0.814			
		COST2r	0.935			
	Compatability			0.742	0.742	0.590
		C1	0.755			
		C2	0.781			
	Perceived Use			0.901	0.897	0.688
		PU1	0.798			
		PU2	0.739			
		PU3	0.748			
		PU4	1.004			
	Perceived Ease of Use			0.830	0.833	0.625
		PEOU1	0.801			
		PEOU2	0.823			
		PEOU3	0.745			
	Attitude			0.869	0.868	0.687
		AT1	0.866			
		AT2	0.796			
		AT3	0.824			
	Behavioural Intention			0.706	0.754	0.528
		BI1	0.863			
		BI2	0.830			
		BI3	0.390			

Notes: N=80. r, Reverse-Coded Items,; CR=composite reliability; AVE=average variance extracted; Some items were removed to increase validity and reliability.

A3. Inter-correlation matrix.

	ATT	COMP	CS	COST	DS	BI	PEOU	PU
ATT	**0.829**							
COMP	0.795	**0.768**						
CS	0.322	0.276	**0.755**					
COST	0.086	-0.183	-0.076	**0.877**				
DS	0.618	0.457	0.809	0.071	**0.509**			
BI	0.767	0.737	0.328	-0.232	0.543	**0.727**		
PEOU	0.418	0.212	0.163	0.467	0.255	0.280	**0.790**	
PU	0.762	0.697	0.242	0.003	0.337	0.692	0.259	**0.829**

Notes: ATT, attitude; COMP, compatibility; CS, consumption satisfaction; COST, cost; DS, decision satisfaction; BI, behavioural intention to use; PEOU, perceived ease of use; PU, perceived usefulness.

A4. Multigroup Analysis Results

Path	β-Coefficient (control group)	β-Coefficent (test group)	p-Value (control group)	p-Value (test group)
ATT -> CS	-0.049	0.283	0.716	0.051
ATT -> DS	0.437	0.652	0.010	0.000
ATT -> BI	0.518	0.740	0.005	0.000
COMP -> ATT	0.525	0.161	0.000	0.078
COST -> ATT	0.104	-0.212	0.457	0.064
DS -> CS	0.702	0.416	0.000	0.005
PEOU -> ATT	0.085	0.417	0.645	0.000
PU -> ATT	0.275	0.593	0.091	0.000

Notes: ATT, attitude; COMP, compatibility; CS, consumption satisfaction; COST, cost; DS, decision satisfaction; BI, behavioural intention to use; PEOU, perceived ease of use; PU, perceived usefulness.

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